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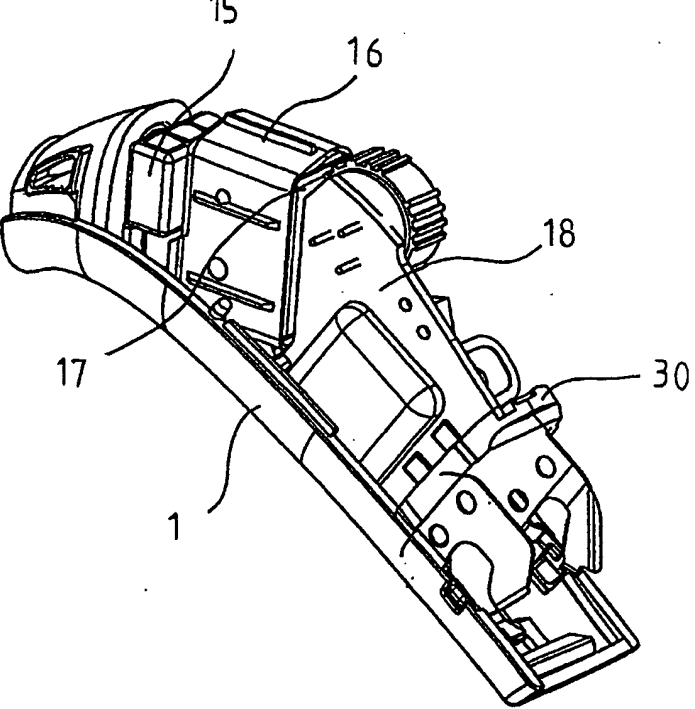
**Title:
A HEARING AID**

Abstract:

The invention relates to a hearing aid comprising a housing containing a microphone, an amplifier, a receiver and a battery for power supply, the housing comprising a front end and a rear end, a top area and a bottom area, where at the top area a hook is placed for transmittal of acoustic signals from the receiver into the ear of the user. The hearing aid is characterized in that the housing comprises two connectable and detachable parts having lines of separation extending at least partly between top and bottom at both sides of the housing between the front end and the rear end, where in the front part means are provided for holding the amplifier circuitry board at one edge.



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<p>(21) International Application Number: PCT/DK99/00533</p> <p>(22) International Filing Date: 7 October 1999 (07.10.99)</p> <p>(30) Priority Data: PA 1998 01268 7 October 1998 (07.10.98) DK</p> <p>(71) Applicant (for all designated States except US): OTICON A/S [DK/DK]; Strandvejen 58, DK-2900 Hellerup (DK).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): BØGESKOV-JENSEN, Tom [DK/DK]; Oticon A/S, Strandvejen 58, DK-2900 Hellerup (DK). SEVERIN, Bent [DK/DK]; Oticon A/S, Strandvejen 58, DK-2900 Hellerup (DK). NØRGÅRD, Jesper, Bach [DK/DK]; Oticon A/S, Strandvejen 58, DK-2900 Hellerup (DK).</p>		<p>(81) Designated States: AU, CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published Without international search report and to be republished upon receipt of that report.</p>
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<p>The invention relates to a hearing aid comprising a housing containing a microphone, an amplifier, a receiver and a battery for power supply, the housing comprising a front end and a rear end, a top area and a bottom area, where at the top area a hook is placed for transmittal of acoustic signals from the receiver into the ear of the user. The hearing aid is characterized in that the housing comprises two connectable and detachable parts having lines of separation extending at least partly between top and bottom at both sides of the housing between the front end and the rear end, where in the front part means are provided for holding the amplifier circuitry board at one edge.</p> 		

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TITLE

A hearing aid

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BACKGROUND OF THE INVENTION

The invention relates to a hearing aid comprising a housing containing a microphone, an amplifier, a receiver and a battery for power supply, the housing comprising a front end and a rear end, a top area and a bottom area, where at the top area a hook is placed for transmittal of acoustic signals from the receiver into the ear of the user.

Such hearing aids are well known within the art as so-called BTE hearing aids. The front end is the end, which abuts the ear of the user. The manufacturing of such hearing aids is normally carried out by a manual assembling process. It is obvious that the assembling process is a cost and time-consuming process, as the many tiny parts require a significant accuracy.

Usually the hearing aid of this type comprises a housing, which has lines of separation extending at the front end and at the rear end. This type of housing makes the assembling process rather cumbersome and time consuming since the inner housing is poorly accessible. This means that the initial price of the hearing aid becomes high as well as the cost of subsequent repair necessitating a separation of the two housing parts.

25

A further previously known hearing aid comprises a frame, which carries the operating parts of the hearing aid. It is clear that such a frame applies more weight to the hearing and therefore is undesirable.

The objective of the present invention is to provide a hearing aid, which facilitates the assembling process and furthermore makes an at least partly automated assembly possible without increasing the weight of the hearing aid.

SUMMARY OF THE INVENTION

According to the invention this is obtained by a hearing aid of the type
5 described in the introductory part of the description and which is
characterized in that the housing comprises two connectable and detachable
parts having lines of separation extending at least partly between top and
bottom at both sides of the housing between the front area and the rear area,
where in the front part means are provided for holding at least the amplifier
10 circuitry board.

Since the front part is separated as suggested and since this part comprises
means for holding the microphone, the amplifier and the receiver it has been
made possible to access the holding means much easier using manual
15 assembly methods and also using automated assembly machinery such as
industrial robots. The result of this is a significant decrease in time consuming
by manual assembly hereby obtaining a more cost effective assembly process
and furthermore the possibility of using a assembly machinery hereby also
obtaining a more cost effective assembly. In both cases the final product will
20 be producible with lower costs hereby increasing the competitiveness of the
hearing aid. The self-sustaining character of the hearing aid housing maintains
the desirable low weight.

In a preferred embodiment part further comprises means for holding the
25 microphone possibly in a microphone suspension.

In a further preferred embodiment the front part further comprises means for
holding the receiver, possibly in a receiver suspension.

30 Preferably the means for holding the circuitry board comprises at least one slot
for receiving a side edge of the circuitry board. A further possibility consist in

that the front part comprises mutually separated protruding holding means for receiving a side edge of the circuitry board.

5 The rear part is adapted to hold the side edge opposite the one received in the front part.

The invention will be explained more detailed in the following with reference to the drawings.

10 BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a BTE hearing aid according to the invention;

FIG. 2 is an exploded view of the hearing aid shown in FIG. 1;

15

FIG. 3 is a top view of the front part of the housing;

FIG. 4 is a bottom view of the rear part of the housing;

20 FIGS. 5-11 are perspective views of the front part of the housing during the assembling process;

DESCRIPTION OF A PREFERRED EMBODIMENT

25 From FIG. 1 a hearing aid appears, which comprises a housing divided into two shell parts, a first shell part 1 and a second shell part 2. At the upper end of the housing a hook is mounted in an adapter part. An acoustic inlet opening 10 appears as well as a volume control 20, an activating button 23 and a battery drawer 27. An aperture 38 for accessing a battery terminal appears.

30

From FIG. 2 an exploded view of the hearing aid shown in FIG. 1 appears. The hook 3 comprises a circumferential recess 4 at the coupling end. It appears that

the hook is mounted in an adapter part 5, which is mounted in an aperture in the first shell part 1 and is held in place by means of two flexible legs 6,7 having at their outer ends barbs cooperating with internal shoulders around the aperture 8 in the first shell part. The opposite end of the adapter 5
5 comprises four flexible wall parts separated by incisions and having internal barbs adapted to cooperate with the recess 4 in the hook 3.

The first shell part comprises an acoustic inlet channel which at the outer end is branched into two opposed acoustic inlet openings 10,11 located at the sides
10 of the first shell part. A thin protruding wall 12 surrounds each inlet opening. At the inner end the channel faces a cavity 13 for holding a microphone suspension 14 which holds the microphone 15. Beneath the cavity 13 for holding the microphone suspension and the microphone the above-mentioned aperture 8 for the hook adapter is situated. A receiver 17 is adapted to be
15 placed in a receiver suspension 16, which is inserted into the aperture and into the adapter. The outer end of the suspension forms a seal against the hook 3 when this is mounted in the hook adapter.

In the first shell part holding means are provided for receiving and holding a
20 circuitry board 18 which on its side holds an amplifier 19, a volume control 20, a telecoil (not visible), programming terminals 21 and a switch 22 adapted to be activated by the activating button 23. These holding means comprise holding slots 33,34 (see FIG. 3) for the end areas of the board at one side edge of this. This means that the board is fixed in transversal as well as longitudinal
25 translation and may only be inserted and removed in a direction parallel to the board plane. Between the slots apertures 49 for the programming terminals on the circuitry board are provided for allowing access to these from the outer surface of the housing. At the end of the first shell part a locking recess 50 is provided. A recess 29 is provided for receiving a terminal wall 30 being
30 provided with terminals 31,32 for contacting the battery and further terminal 36,37 for external access through apertures 38,39.

The second shell part comprise apertures 24 for receiving and surrounding the protruding walls 12 around the acoustic inlets 10,11 on the first shell part. At the opposite end of the second shell part a locking arm 25 having a barb 26 is provided. This locking arm 25 and the barb 26 together with the apertures 24 at the opposite end of the second shell part and the protruding wall 12 and the locking recess 50 on the first shell part forms the releasable locking means of the two shell parts. In the second shell part the battery drawer is mounted to be pivotable around a shaft 28. The two shell parts may be dismantled using a tool which comprises two arms adapted to be inserted between the first and the second shell part in the area where these are mutually connected at the acoustic inlets. Upon insertion the second shell part will be expanded to a state where this may be lifted away from the protruding wall parts and hereby may be released from the first shell part.

From FIG. 3 the wall elements 12 surrounding the inlet openings 10,11 appear. It appears that the lower edge of the wall element will retain the second shell part against an upward directed movement. At the opposite end of the first shell part a recess 50 is provided, which is adapted for receiving a barb 26 on an arm 25 of the second shell part. Furthermore guide rails 40,41 on the first shell part appear as well as stays 42,43 for increasing the rigidity of the construction, especially against pressure from the side. These elements 40-43 cooperate with apertures or recesses 44-47 in the second shell part. Guide taps for the terminal wall in the recess 29 appears as well.

From FIG. 4 the arm 25 with the locking barb 26 appears. Furthermore the holes 44,45 for receiving the stays of the first shell part appears as well as the recesses 46,47 for receiving the guide rails of the first shell part. Furthermore a holding means 48 for holding the circuitry board at a side edge opposite the one held in the first shell part is provided in the second shell part.

30

The assembling of the hearing aid is carried out by fixing the first shell part and hereafter placing the microphone suspension in the aperture adapted for

this purpose, as shown in FIG. 5. Afterwards the microphone is placed in the microphone suspension as shown in FIG. 6. The receiver suspension is mounted and the receiver is mounted in the receiver suspension as shown in FIG 7. Following that the terminal wall is mounted in the first shell part, as shown in FIG. 8, and the circuitry board is inserted, as shown in FIG. 9. The electrical connection between the circuitry board and the terminals is achieved by abutment of the free ends of the terminals with contact pads on the circuitry board. Afterwards the second shell part is mounted on the first shell part by snap locking as shown in FIG. 10. The battery drawer is mounted in the second shell part and the hook is mounted in the housing as shown in FIG. 11.

The hearing aid described in the foregoing may be assembled at least partly in automated manufacturing equipment comprising one or more robots. This will significantly reduce the labor intensive manufacturing process, which is normally used in the hearing aid manufacturing. Even when not using robots the construction of the hearing aid as described in the foregoing provides a significant reduction in the manual assembling process.

CLAIMS

1. A hearing aid comprising a housing containing a microphone, an amplifier,
a receiver and a battery for power supply, the housing comprising a front
5 area and a rear area, where the front area in a normal mounted position
abuts the wearers ear, a top area and a bottom area, where at the top area a
hook is placed for transmittal of acoustic signals from the receiver into the
ear of the user, characterized in that the housing comprises two connectable
and detachable parts having lines of separation extending at least partly
10 between top and bottom at both sides of the housing between the front area
and the rear area, where means are provided for holding the amplifier in
one of the two parts.
2. A hearing aid according to claim 1, characterized in that one of the parts
15 further comprises means for holding the microphone, possibly in a
microphone suspension.
3. A hearing aid according to claim 1 or 2, characterized in that on of the parts
further comprises means for holding the receiver, possibly in a receiver
20 suspension.
4. A hearing aid according to claim 1, 2 or 3, characterized in that the means
for holding the circuitry board comprises at least one slot for receiving a
side edge of the circuitry board.
25
5. A hearing aid according to any of the claims 1-4, characterized in that one
of the parts comprises mutually separated protruding holding means for
receiving a side edge of the circuitry board.
- 30 6. A hearing aid according to any of the claims 1-5, characterized in that the
opposed housing part is adapted to hold the side edge of the amplifier or
the circuitry board (PCB) opposite the side received in the first part.

7. A hearing aid according to any of the claims 1-6, characterized in that the amplifier, the circuitry board, the microphone and/or the receiver are/is received in the front part.

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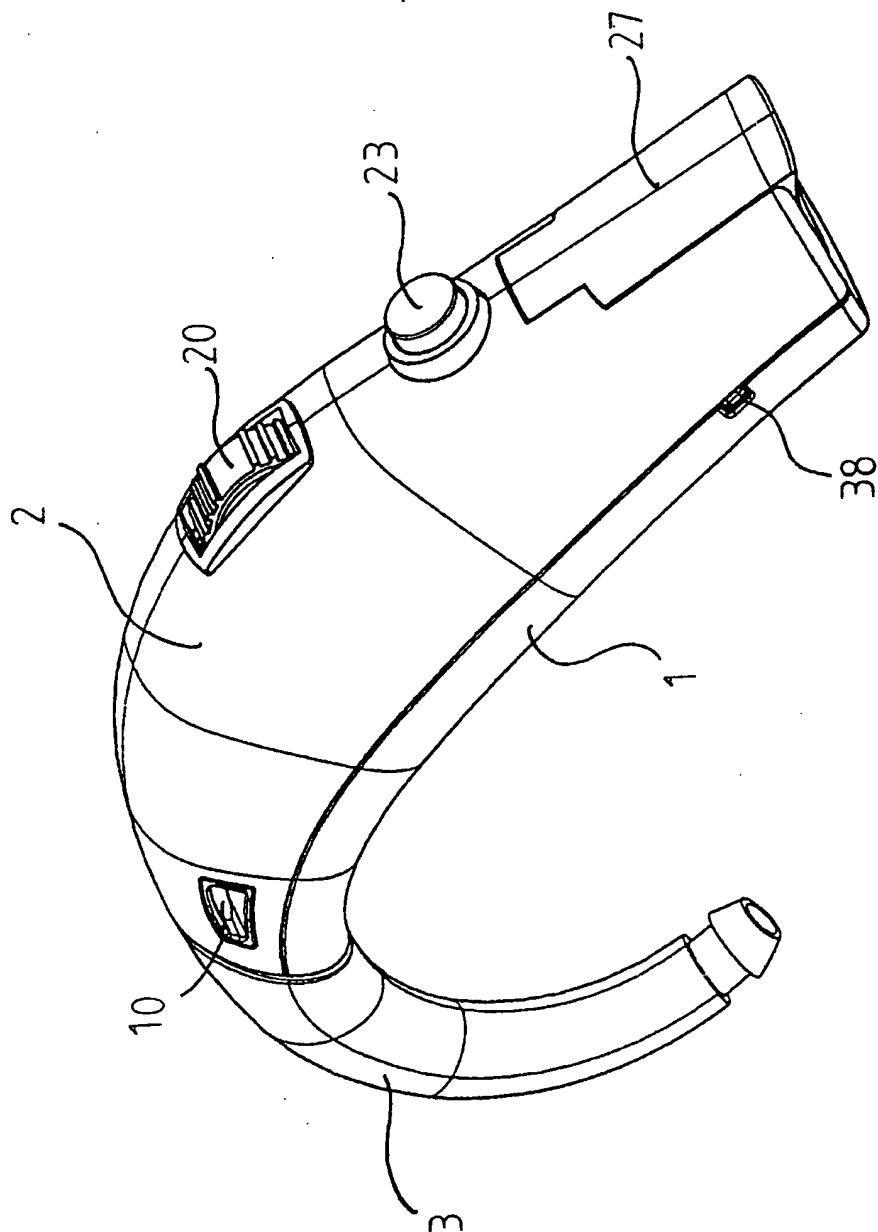
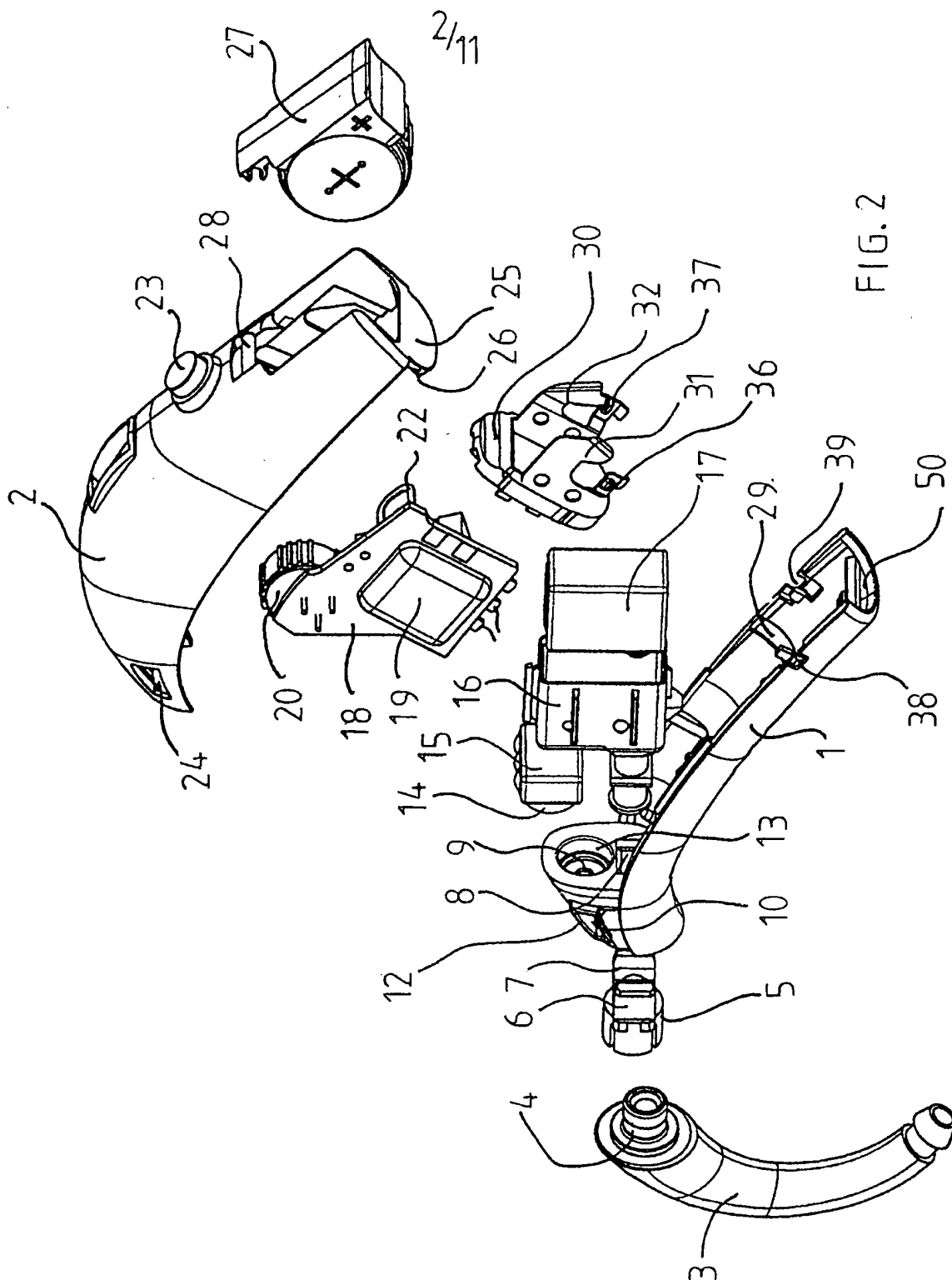


FIG. 1



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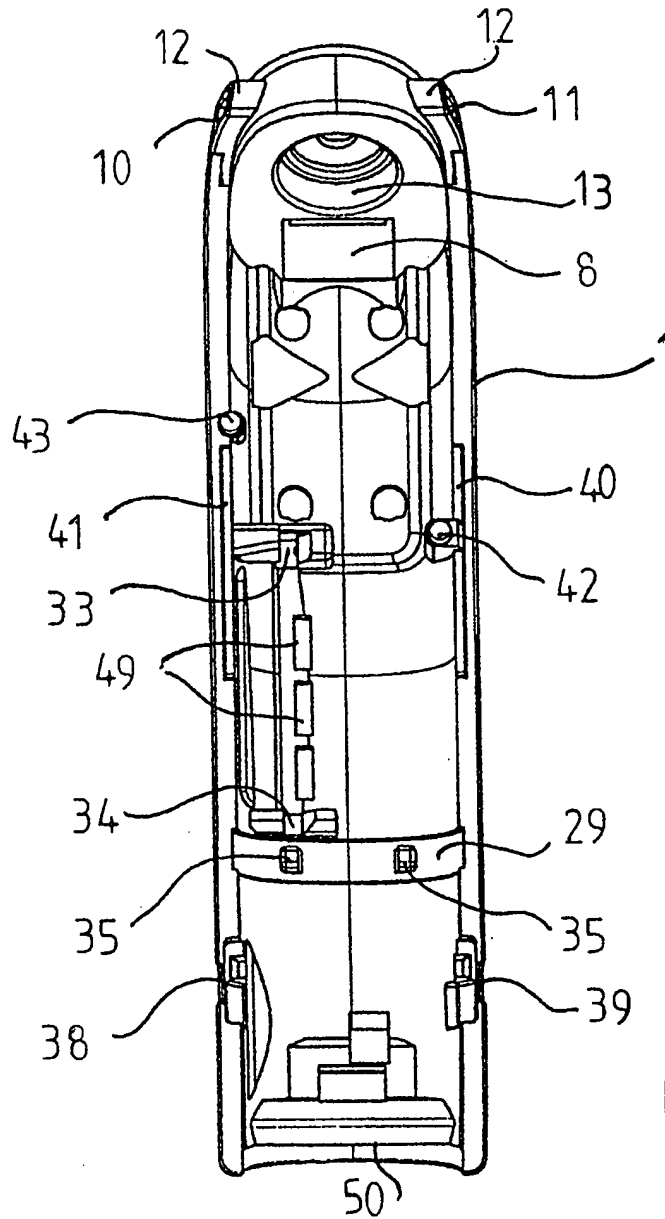


FIG. 3

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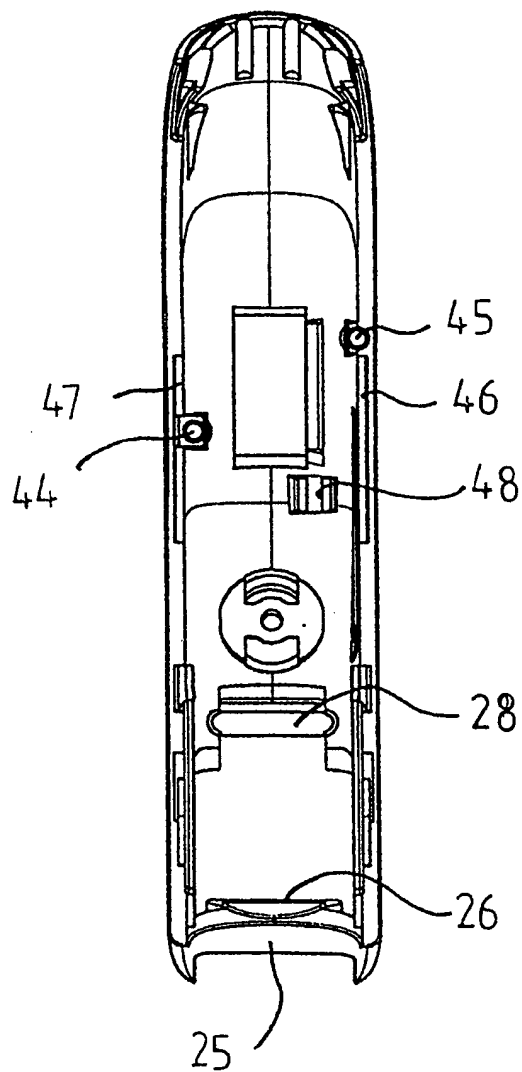


FIG. 4

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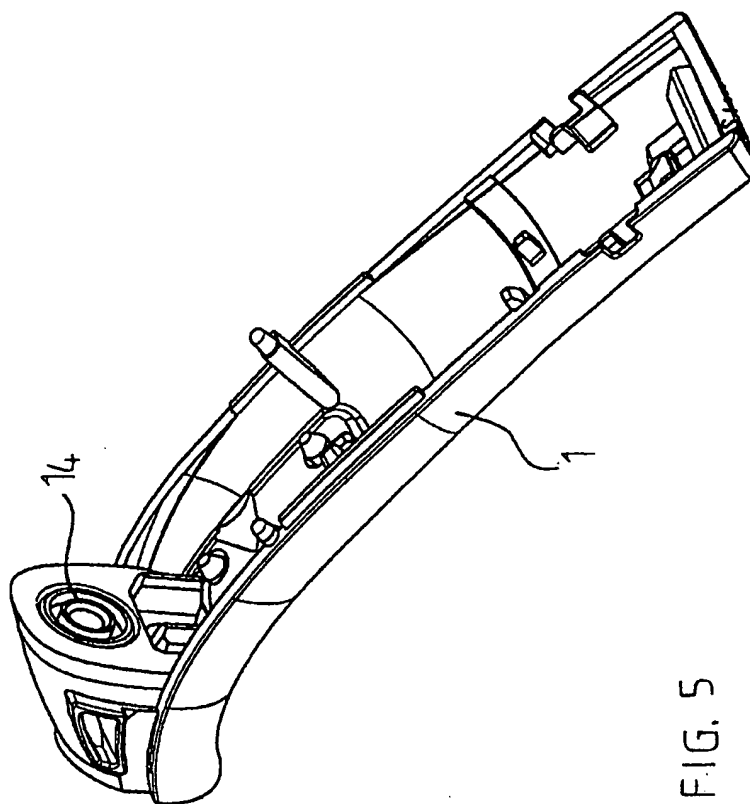
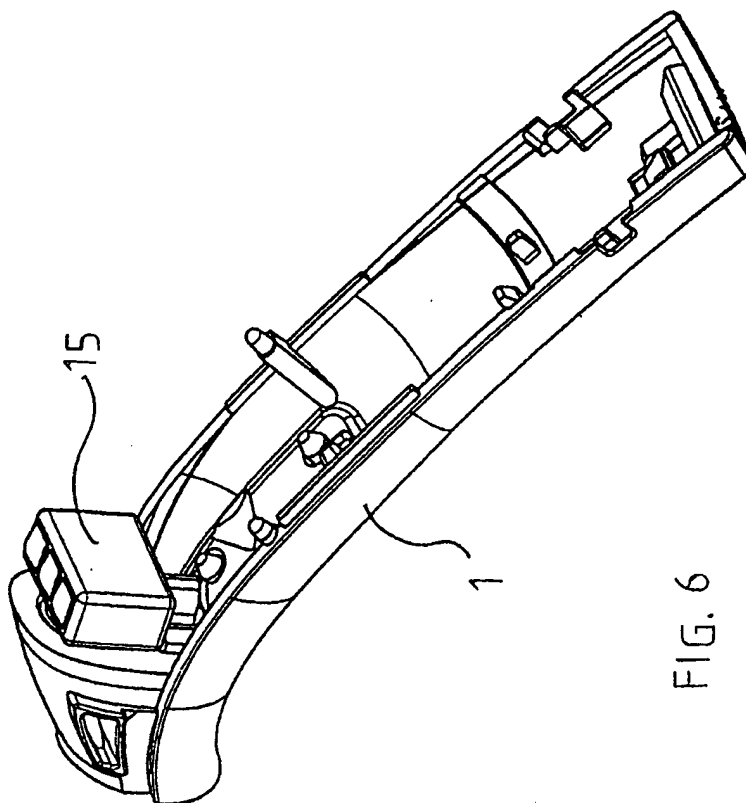


FIG. 5

6/11



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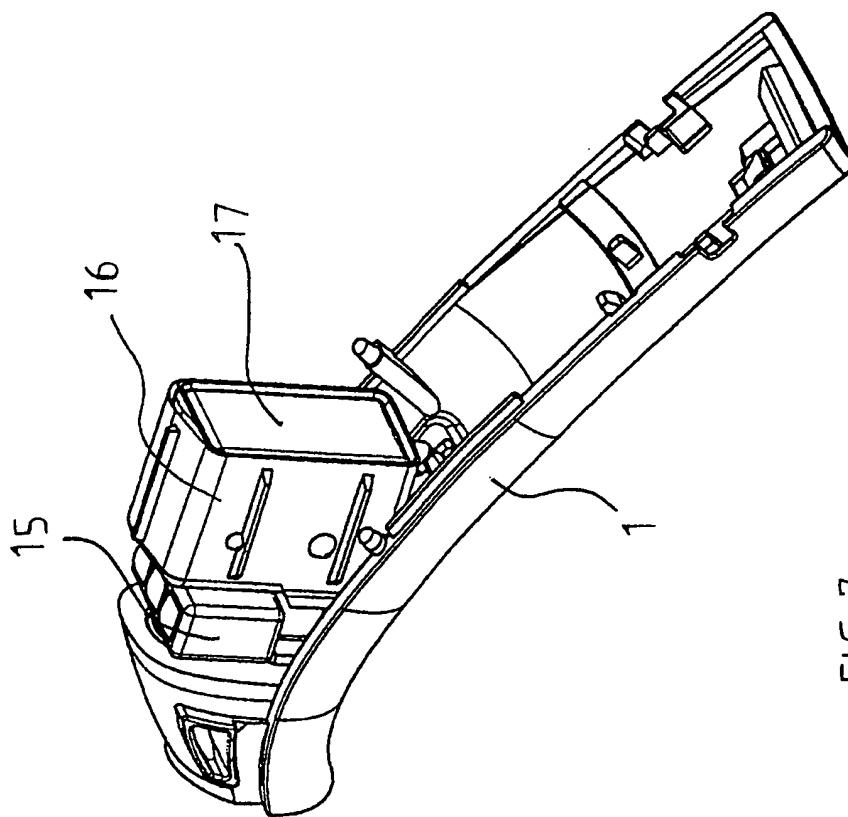


FIG. 7

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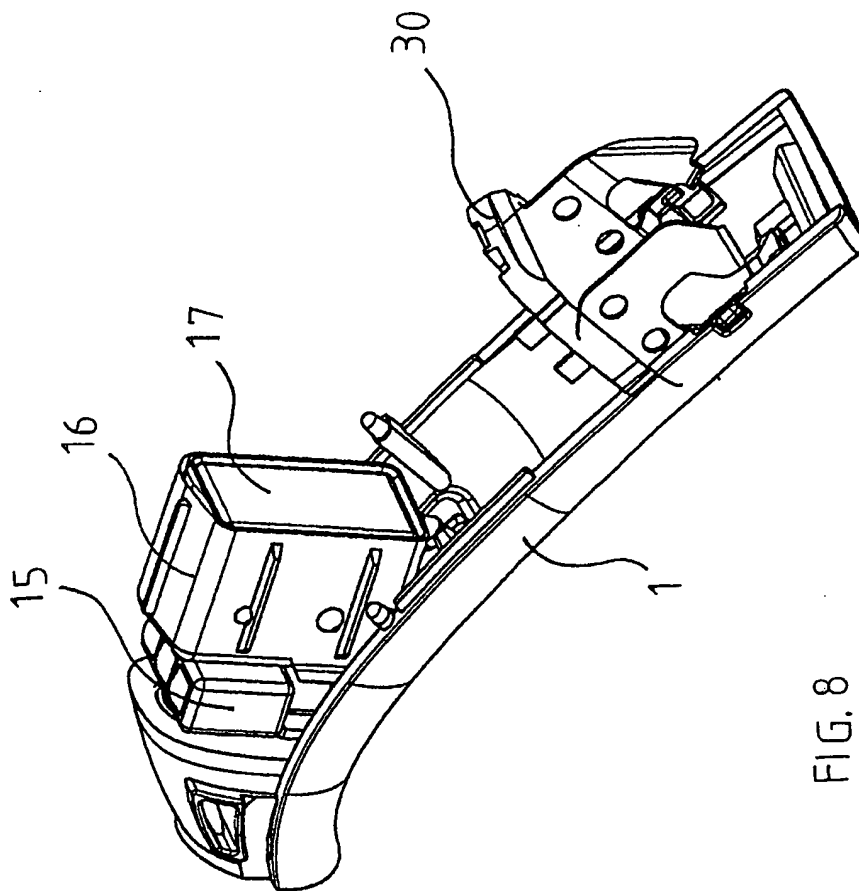


FIG. 8

9/11

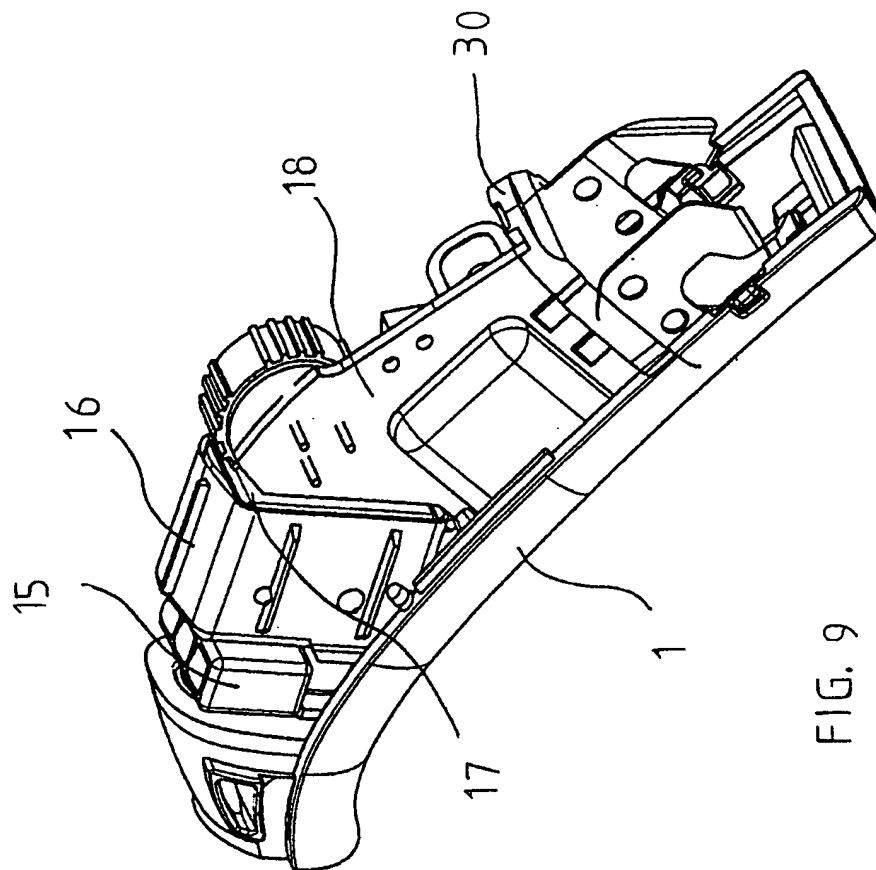


FIG. 9

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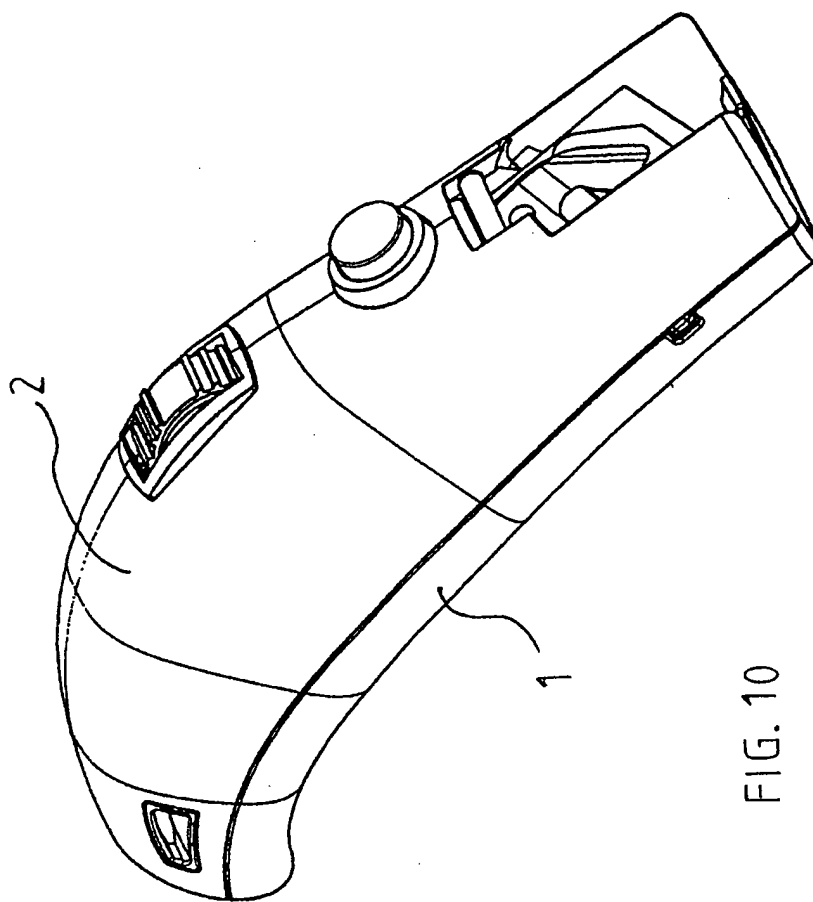


FIG. 10

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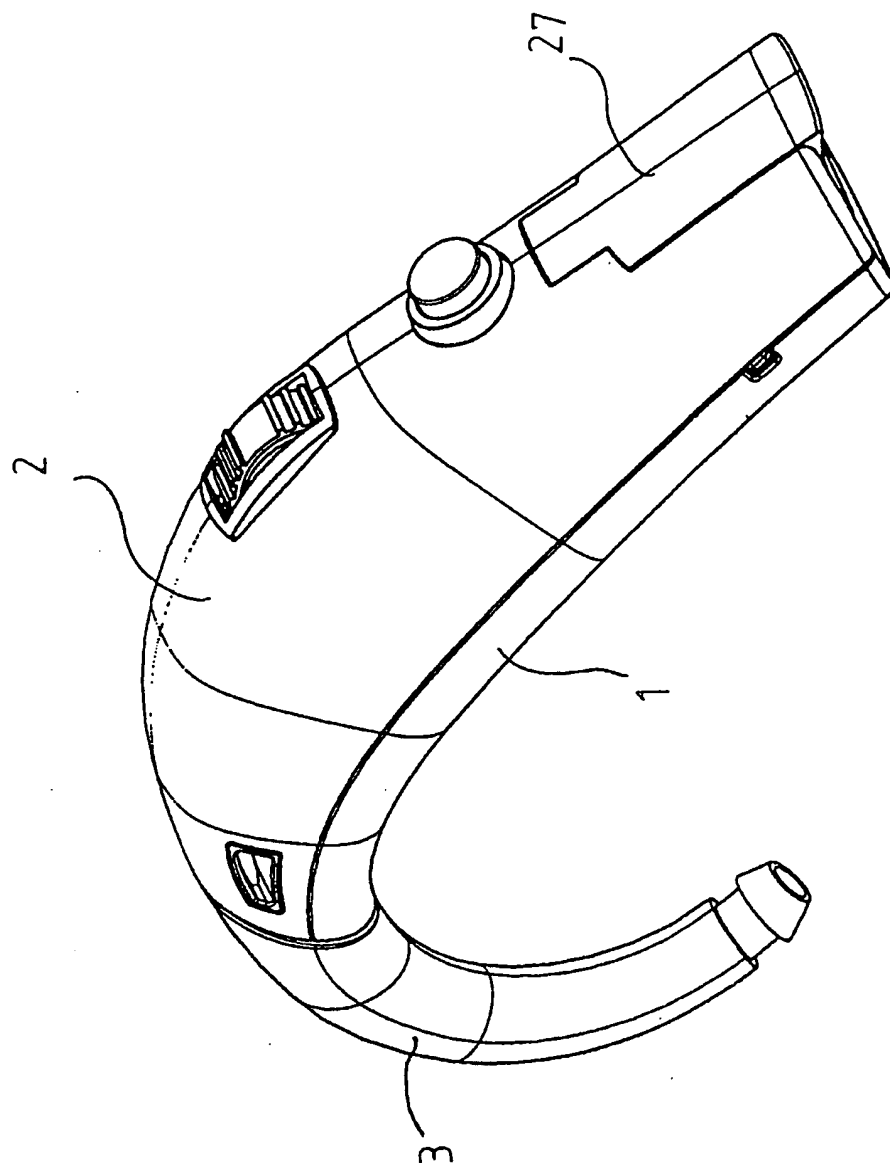


FIG. 11